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President Lyndon Johnson dedicates BART's Diablo Test Track on June 19, 1964. Gov. "Pat" Brown is at the left and BART Board President Adrien Falk on the right.

## Still Rolling After All These Years

**T**HE cars were sleek and shiny and yet—even as the wide-eyed throng streamed through the gates—George Silliman couldn't help but wonder, "My God, is this thing really going to work?"

The former BART director, who'd witnessed BART's transformation from paper to steel and concrete, remembers the inaugural passenger run when jubilation was mingled with "almost disbelief."

"The feeling was, we're finally doing it," said Silliman, who presided at the gala ceremony marking BART's first day of passenger service on Sept. 11, 1972.

Today's trains cruise up to 80 miles an hour, taking on passengers at just under four-minute intervals during peak hours. The 34-station, 71.5 mile system is available to about 3 million residents of the three BART counties.

As BART moves into the new era of public transit following two decades flush with success and challenge, consider that:

- ◆ BART patronage has far outstripped Bay Area population over the last decade. While the population of the three BART counties increased 18 percent, BART ridership soared an amazing 105 percent.
- ◆ BART is one of the few public entities creating jobs in the lackluster economy. The BART extensions coupled with a contract signed this spring for the next generation of cars will generate an estimated 147,000 jobs over the next decade.
- ◆ Staff has nearly quadrupled—from 762 to 2,774—making BART one of the largest public employers in the region.
- ◆ Patronage has shot up more than 1,300 percent—from 5.5 million the first 12 months of operation to *more than 73 million passengers last year*.
- ◆ The maximum BART fare, when adjusted for inflation, has actually *fallen* a little—from \$1.25 in 1972 to \$3 today—despite the additional stations, the TransBay Tube, and miles of track that have come on-line in the ensuing years.

In a "report card" to the California Trans-

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## When the Car Was King

**T**HE soft, slake days of Sam Spade and Brigid O'Shaughnessy were gone. The war was over, business was booming and the car was king.

And something had to be done about it.

Congestion on the Golden Gate and Bay bridges—built only the decade before—was fouling the air and choking commerce. Far-sighted civic leaders and community groups began to address the region's rapidly emerging transportation needs.

Some historians mark these early ad hoc brainstorming sessions as the genesis of BART—which celebrates its 20th Anniversary of passenger service on Sept. 11, 1992.

It was fortunate that foresight prevailed.

Take a break from your newspaper or neighbor on the train today, look at I-880 or the Bay Bridge and ponder the commute without BART.

"It would be as permanently agonizing for the Bay Area as it has been for the past two and a half years on U.S. 101 with (earthquake-damaged) I-280 closed," says State Senator Quentin Kopp.

The idea of a regional rapid transit system

gathered momentum in 1947 with the release of a report by a joint Army-Navy review panel. The panel warned that there must be another transbay link or the Bay Bridge would be doomed to "intolerable" congestion.

The military envisioned electric trains barrelling under the Bay through a tube—an idea first raised by Major Gen. George W. Goethals, builder of the Panama Canal.

Responding to growing public clamor, the Legislature in 1951 created the 26-member, nine-county San Francisco Bay Area Rapid Transit Commission charged with studying the region's long-range transit needs and saving it from gridlock.

In 1957 the Commission concluded, "If the Bay Area is to be preserved as a fine place to live and work, a regional rapid transit system is **essential** to prevent total dependence on automobiles and freeways."

Heeding the report, the Legislature quickly created the San Francisco Bay Area Rapid Transit District—BART—and granted it power to levy taxes for a general bond measure to finance the system if 60 percent of the Dis-

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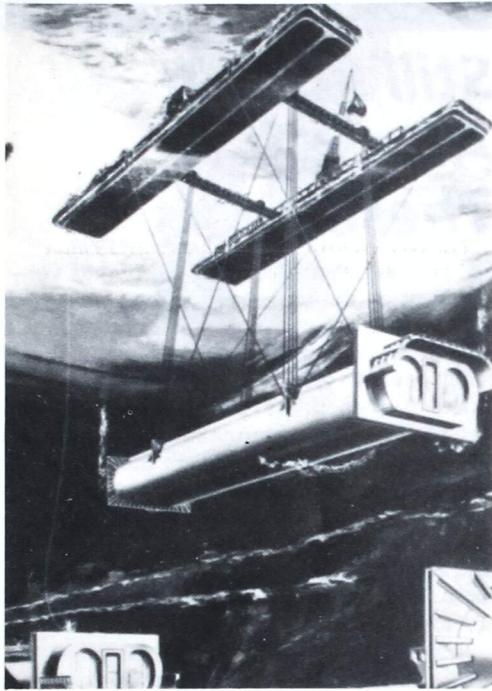


# Ride the Tube—Miss the 'Quake

THERE are about 2,000 people in the Bay Area who did not know that the Loma Prieta Earthquake had rattled and rolled the Bay Area on Oct. 17, 1989.

They were in a pair of BART trains in the TransBay Tube. The power went out and the trains stopped, but the passengers didn't feel a thing.

The Tube was built to withstand an Earthquake, as was all of BART. The shock absorber effect is a bonus.



Artist's rendition of setting a section of the Tube in place.

## BART: Tomorrow's Transit Today

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portation Commission, General Manager Frank Wilson described BART as the "first student of modern 20th Century American transportation." History, he said, will record that "BART has matured from an awkward novice into the premiere urban transit system in the United States."

Sometime early next year, one billion people will have taken BART to jobs, sporting events, museums, concerts, carnivals, festivals and shopping. Passenger miles logged will total a staggering **12.5 billion**.

"I think it would be very difficult to image the region without BART," said William Hein, assistant executive director of the Metropolitan Transportation Commission, the Bay Area's Transportation planning agency. Hein, who was BART planning director from 1970 to 1977, also remembers the awkward early days when he was constantly debating BART's merits with critics.

One gentleman, remembers Hein, scoffed that "BART could be replaced by 18 buses" and leave the commute no worse for wear.

Today, BART moves more people for less money than any modern transit system in

That doesn't surprise the people who built it.

Don Hughes and Shad Wilson clinked their champagne glasses and toasted the making of history from inside the bowels of the 10,000-ton steel and concrete shell.

It was April 1969 and they were celebrating their work on Section 23 of the TransBay Tube in the turbulent murk 135 feet below the surface of San Francisco Bay. There, after being towed into place by specially built barges, guided by engineers using lasers, and fitted by divers using their hands and eyes, the water-tight bulkhead was removed and the 330-foot section of the twin-bore Tube was welded to the adjoining sections.

The 3.6-mile TransBay Tube from Oakland to San Francisco—the longest, deepest underwater transit tunnel in the world—was in place three years after work had begun.

While the Tube cost \$180 million in 1970 dollars, it would cost more than \$2.4 billion to duplicate today.

"We thought our biggest problem would be if the Bay Bridge collapsed on the Tube," said Bill Stokes, who was BART's general manager from 1962 to 1974.

Senior Mechanical Engineer Joseph Van Overveen smiles when he describes the Tube as "simple." The final fusion of tube sections was like "fitting two bottles together," and aligning the Tube perfectly across the trench in pitch-black water was "like laying spaghetti through jelly."

Though it is only a fraction of the 71.1-mile BART system, it is the Tube that still electrifies the world, drawing more interest and queries from the public than any other segment of the BART system.

the United States. A 1990 study of the 30 largest heavy rail transit agencies showed BART's cost per passenger mile was 21 cents compared to an industry average of more than 32 cents.

And BART had the highest farebox—ratio the amount of patron revenue compared to public subsidies needed to operate the system—of any public transit agency in the Bay Area. BART matches every \$1 in fare with \$1 in subsidy.

BART is also an energy miser. The trains are three times as efficient in total energy consumption as the automobile, and a whopping 10 times as efficient during rush hour—which these days seems to be round-the-clock.

Bill Stokes, who was BART's general manager for from 1963 to 1974, said the Bay Area got plenty of its bang for its buck.

In fact, contends Stokes, BART is "the best buy the public has gotten *anywhere, or ever* will get."

The entire system was built for about \$1.6 billion. Today, BART is worth nearly **\$8 billion**.

Since it opened on Sept. 16, 1974—two years after BART began service some 450 million passengers have traversed the Bay through the Tube—nearly twice the population of the United States.

Isaac Rodrigues of Hayward was among the thousands of workers who had walked, biked or jogged through the Tube before it opened for business, so he knew the way when he was at the helm of the first BART train to carry passengers across the bottom of San Francisco Bay.

"At first it didn't feel any different to me," he said. That changed when he saw 1,500 dignitaries pack the train "like sardines" and when he pulled into the Powell Street to "one hell of a crowd."

More than 6,000 people rode BART through the Tube that first day, whisking under the white caps at 70 to 80 miles an hour.

Former BART director George Silliman, also a veteran of that first run, thought it magic. "Here we were, 135 feet below the surface of the Bay, making the trip in 12 minutes."

Today, it takes about seven minutes.

The idea for a trans-Bay transit tunnel first arose in 1920 when Major General George W. Goethals, fresh from building the Panama Canal, proposed one "in order to solve the acute transportation problems" facing the Bay Area. That was long before the World War II migration that brought hundreds of thousands of workers and their families to the Bay Area—and longer still before the car became king.

The idea was revived in 1947 when a joint Army-Navy commission again called for an underwater tunnel. It is no coincidence that BART's TransBay Tube follows the lines laid out by Gen. Goethals.

The TransBay Tube was not "tunneled" beneath the floor of the Bay, but lies in a trench that was scooped from the Bay's bottom. The trench itself is about 60-feet wide and 60- to 100-feet deep, and displaced enough sediment to fill a football field nearly a mile high.

The binocular-shaped sections of the Tube were built at the Bethlehem Shipyard in San Francisco. A pair of passageways, one atop the other, run between the bores. The bottom passageway is the emergency exit from the Tube and houses utility lines. The top passageway is the ventilation system.

BART engineers developed a unique "cathodic protection system" that uses positively charged anodes to help prevent corrosion of the Tube's steel skin.

Each section of the Tube was set in the trench and held in place with 500 tons of ballast and covered with backfill. Four 50-ton hydraulic couplers clamped the sections together while the seams were sealed and welded. Unique flexible joints at each end of the Tube link it to BART's land-locked tunnels in San Francisco and Oakland. The flexible joints "give" during Earthquakes.



# Watch Us Grow!

**B**ART is rushing toward the 21st century on the fast track, poised to boldly go where no single railroad in the Bay Area has gone before. And in BART's tracks there will be less congestion, cleaner air and economic growth.

In the past year, BART's long-awaited extension plans to Eastern Contra Costa and Alameda counties and to the San Francisco Peninsula got rolling under a program that will generate an estimated \$2.6 billion and 147,000 jobs over the decade.

Those impressive numbers are based on a Washington, D.C.-based think tank's economic model which notes that 5,720 jobs are created for every \$100 million spent on capital rail projects.

The Phase 1 Extensions—BART's first since it began passenger service 20 years ago—are part of an ambitious expansion and overhaul plan that envisions a 900-car, 80-train system stopping at some 45 stations by the year 2000.

Today's BART is a 71.5-mile, 34-station system carrying an average of 255,000 passengers each week day—1.5 million passengers per week.

The extensions—the single largest construction project in the Bay Area since BART was built—will serve people in Castro Valley and Dublin/Pleasanton, North Concord/Martinez and West Pittsburg, Warm Springs south of Fremont, and from Colma to San Francisco International Airport.

"BART's on a fast track to the future," BART Director Erlene DeMarcus declared at last year's groundbreaking ceremonies for the East Alameda and Contra Costa county lines, "and it's getting there ahead of schedule."

To date, the extensions are about a year ahead of schedule. Trains will roll into Dublin in 1995, into West Pittsburg by 1997, and to San Francisco International Airport by the turn of the millennium.

As initially conceived, BART was to encircle San Francisco Bay. For now, BART's focus is on its Contra Costa, Alameda County and Peninsula extensions.

But Nello Bianco, Vice President of the BART Board of Directors, sees the day when

BART may stretch across the Carquinez Strait to Solano County, though that's a project for the 21st Century.

Director Bianco met with officials from Solano, Napa and Contra Costa counties two years ago to discuss the idea. Traffic along I-80, one of the most congested, heavily travelled stretches of the Federal Interstate Highway System, threatens to turn Solano County into "a vast parking lot," he said.

Other ideas that would involve BART to ease congestion between the East Bay and San Francisco were outlined in a March 1991 Metropolitan Transportation Commission Report.

They include another underwater BART tube linking the Oakland and San Francisco airports at an estimated cost of \$3.7 billion—more than double the cost of the existing TransBay Tube—or a second BART tube paralleling the existing one.

BART and Oakland International Airport officials are also working on ideas to extend BART to the East Bay airport via a "people mover."

But those are merely some of the myriad ideas to deal with the Bay Area's worsening traffic quagmire.

One day, your rail itinerary might include a morning at Great America in the south bay, a noon-wine tasting in the Napa Valley, an afternoon concert in San Francisco, and a twilight A's game.

But because BART was the first urban rail system built in the United States in more than half a century—and went on to become the bulwark of Bay Area transportation—the 20-year-old system is showing its age.

The system, from its computers to its cars, is no longer state-of-the-art. Nearly a billion people have cycled through its fare gates, ridden its escalators and stood on its weather-worn stations. The typical BART car has traveled *more than a million miles*. Soon BART will chalk up its 12 billionth passenger mile.

In what was hailed as a "grand slam" and a major step in a planned billion-dollar rehabilitation program, BART this spring tapped Morrison-Knudsen Corp. to build the next generation of BART cars in Contra Costa



*Mrs. Gertrude Guild, BART's first fare-paying passenger. Nearly 1 billion passengers have ridden BART in the past 20 years.*

County. BART has also begun refurbishing the stations and upgrading its computer and communications systems.

In short, BART is moving ahead the times, because—as General Manager Frank Wilson promises—"Unlike other American transit systems, we will not go quietly into the long gray night. We are the cutting edge of transit in America and the backbone of the Bay Area."



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# 'Good God, Now We've Got to Build this Son of a Gun'

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trict's voters would approve the bonds.

Despite the howls for "congestion" relief, many officials doubted voters would tax themselves to build what would be the most expensive regional public works project in U.S. history—792 million in 1962 dollars, or more than \$2.5 billion today.

The pundits were wrong. In November 1962, the public narrowly approved the measure to build what had been whittled down to a three-county system serving San Francisco, Alameda and Contra Costa counties.

Following the stunning vote, one powerful state legislator lamented that if he had known the measure was going to pass, he'd have kept it bottled up in committee.

Bill Stokes remembered the election night party at the "command center" at BART's old headquarters on Flood Street in San Francisco.

By 4 a.m., the party had dwindled to Stokes, then the head of public relations, and Jack Iverson, a principal of one of the three major engineering firms that would build BART. Iverson was curled up beneath a conference table, trying to rest.

When the outcome was no longer in doubt, Stokes recalled, "I kicked him and said, 'We got it!'"

Iverson's groggy response: "Good God, now we've got to build this son of a gun."

Stokes went on to become the district's second general manager (1963-1974).

A scant month after the vote, a taxpayers group sued to challenge the legality of not only the election—but the District itself.

BART won, but not before six months of litigation added \$12 million to the BART tab. The suit was but the first of many delays stemming from agreements that had to be reached with nearly 170 parties, including powerful local governments.

The public's two-decade dream reached fruition on June 19, 1964, when President Lyndon Johnson flew by helicopter to a tawny field between Concord and Walnut Creek where hundreds of people had gathered to see him preside at the ceremonial groundbreaking for the Diablo Test Track.

There, the BART dream was born as engineers honed the design for BART's car and automatic train control system.

Senior Mechanical Engineer Joseph Van Overveen, who was on the first test run conducted in pelting rain, said the proving ground offered limitless fodder for newspaper stories. "We were living and we are still living in a goldfish bowl," he said. "Every time somebody would sneeze, somebody would write an article."

By this time, the District's three major contractors had mustered what was the greatest engineering force ever assembled for a single public works project in the United States. The scores of firms and thousands of workers—sandhogs, welders, barge crews, crane operators and divers—would make engineering history.

The mid-1960s saw several milestones

including groundbreaking for the Oakland Subway, the bore through 3.2 miles of serpentine-laced rock in the Berkeley hills, and the world-famous TransBay Tube.

While the TransBay Tube electrified the world, the Market Street subway and stations proved to be one of the most fascinating, dangerous and gritty endeavors.

Burrowing 80 to 100 feet below the constant trundle of downtown traffic, sandhogs slogged through a bewildering spaghetti of underground utilities installed in the past century. Their claustrophobic world, made dangerous by the twin pressures of Bay mud and water, held architectural treasure.

Toiling under compressed air conditions—a first for tunnelling in the Western U.S.—workers rediscovered fragments of 19th Century San Francisco: ships and artifacts abandoned when Market Street and the Embarcadero were under water.

Just as the Transcontinental Railroad shaped California's history in the 19th Century, the construction of BART began to shape the Bay Area. Hardhats snapped up homes in eastern Contra Costa and southeast Alameda counties that would be linked soon to the financial and commercial hubs of the region.

But even as the concrete hardened and the railroad began taking form, the ambitious plan was being threatened.

Annual inflation in the 1960s, let loose by the Vietnam War, averaged more than 7 percent—better than twice what the engineers had projected. To woo contractors away from war work, BART had to pay them time-and-a-half for regular hours. At the height of construction in 1969, BART was paying contractors \$1 million *each week*.

The estimated cost of the Tube jumped to \$180 million. Cities forced BART to relocate 16 stations and 15 miles of tracks. By 1966,

the District knew it did not have enough money to finish the system.

The State Legislature came to the rescue and approved another half-cent sales tax in the three BART counties, and the federal government offered \$315 million in grants—barely 20 percent of the cost, compared to the 90 percent federal share of highway construction.

By decade's end, construction crews and their thousands of tons of equipment were supplanted by a new horde—electronic, computer and communications engineers that worked round-the-clock to eliminate system bugs. Thousands trekked through the TransBay Tube by foot or bike. Fares were set in 1971: from 30 cents to \$1.25.

Opening day broke cloudy and cool, a respite from muggy Indian Summer. At noon, BART General Manager Bill Stokes boomed over the public address system, "Ladies and gentlemen: this system is now open for revenue service."

A new, high-tech era of American public transit was born.

The anticipation that had built for more than two decades climaxed as thousands bounded through the faregates to ride the most modern urban rail system *in the world*. In that first week, 100,000 people rode the electrified rails and computerize-controlled trains.

"It was just a grand and glorious day," Stokes told BART•Times, "to realize that after all the toil, sweat and tears we were about to carry passengers. I had been slaving on this thing since 1958, through many ups and downs, so I guess you can imagine my feeling."

Gen. Goethals and the dreamers of the '40s had prevailed.

King Car had been successfully challenged.



Excavating under downtown San Francisco unearthed a treasure trove of artifacts about the '49er days.